

Loads. The 1995 TMDL estimated the average load from all the ungaged drains combined in the Parker-to-Kiona reach was 43 tons of suspended sediment per day. In 2003, the average load from the combined eight ungaged drains was 3.7 tons per day.

The sum of the median instantaneous loads of all the ungaged drains was generally one-third to half of the load from Granger Drain (see table, below). This was primarily a reflection of the relatively small amount of water in the ungaged drains.

Drain	Discharge (cfs)	Median instantaneous load				
		Nitrate + nitrite (lb/day)	Total phosphorus (lb/day)	Organic nitrogen+ammonia (lb/day)	Suspended sediment (lb/day)	Fecal coliform (col/sec)
JD 14.6	1.0	1.2	1.0	1.92	446	9.9E+04
DR 27	2.6	75.0	2.5	5.61	1128	2.5E+05
DID 7	6.5	28.3	4.9	9.31	604	3.3E+05
DR 31	3.7	33.0	3.7	7.07	459	2.4E+05
DR 35	1.9	11.5	0.8	1.99	214	3.8E+04
JTDR 2	9.0	83.1	5.4	10.74	1661	3.8E+05
JD 51.4	1.9	3.7	0.5	2.31	12	1.5E+04
JD 52.8	4.7	27.0	2.0	7.27	398	2.6E+05
sum medians all sites	31.1	263	21	46.22	4924	1.6E+06
sum averages all sites	34.5	275	23	53.50	7449	2.9E+06
Granger Drain (RSBOJC data)	51.2	604	56	106.47	15332 (TSS)	5.1E+06
Sulphur Ck Wasteway (RSBOJC data)	201	2191	116.7	383.20	26641 (TSS)	1.7E+07

2003 irrigation season median instantaneous discharge and loads. Data for Granger Drain and Sulphur Creek Wasteway courtesy of Roza-Sunnyside Board of Joint Control.

Regulatory compliance. One drain, DR 35, met the state fecal coliform standards. JD 51.4 met the geometric mean standard but failed the not-to-exceed-top-10% standard. The remainder of the drains exceeded the standards by varying amounts. Dissolved oxygen concentrations in seven of the drains failed the state standard of 8 milligrams per liter. Two drains, JD 51.4 and JD 52.8, exceeded the state pH standard of 8.5. More drains likely would have exceeded the pH standard if sampling had been conducted in the afternoon, when pH values tend to be at their highest. All of the sites exceeded the state temperature standard of 18 degrees Centigrade.

TMDL goal. Seven of the eight drains met the 2002 TMDL goal of 25 NTU. DR 27 was close to but did not meet the goal with a 90th percentile value of 27 NTU. A 90th percentile of 27 NTU means that 90 per cent of the samples were at or less than 27 NTU.

Conclusion

The eight ungaged drains monitored during the irrigation season of 2003 contributed minor amounts of suspended sediment, nutrients, and bacteria to the Yakima River. Because of the relatively minor contributions from the ungaged drains, SYCD will continue to consider Sulphur Creek Wasteway and Granger Drain as the highest priority return drains needing continued water quality improvements. Of the conditions observed within the ungaged drains, nitrate concentrations in DR 27 would be most appropriate for further investigation, as time and resources allow.

Water Quality of Eight Small Irrigation Return Drains, Lower Yakima River, 2003 Irrigation Season



In 2003, to evaluate the effectiveness of the Lower Yakima River Suspended Sediment Total Maximum Daily Load (TMDL), the Department of Ecology sampled the Yakima River and five major irrigation return drains for turbidity and suspended sediment. To supplement their evaluation, the South Yakima Conservation District (SYCD) sampled eight minor irrigation return drains throughout the lower valley. To improve our understanding of conditions in these small drains, SYCD had samples analyzed for nutrients and bacteria in addition to turbidity, suspended sediment, and discharge.

Because the small drains did not have gages to measure flow, they were called ‘ungaged’ drains, in contrast with the major drains which have gages.

Highlights

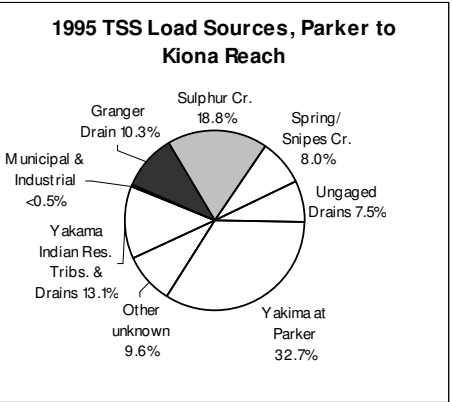
- The eight ungaged drains had minor flows and loads in comparison with two major irrigation return drains within SYCD, Granger Drain and Sulphur Creek Wasteway. A load is the amount per day of a given substance coming from the drain, for example, pounds of nitrogen per day.
- The 1995 TMDL estimated the average load from all the ungaged drains combined in the lower Yakima River (from Parker to Kiona) was 43 tons per day of suspended sediment. In 2003, the average actual measured load from the combined eight ungaged drains was 3.7 tons per day.
- Concentrations of suspended sediment, nutrients, and fecal coliform bacteria in the ungaged drains generally were within the range of concentrations in Granger Drain and Sulphur Creek Wasteway in 2003, with the exception of elevated nitrate concentrations in Drain (DR) 27.
- Concentrations and loads were often highly variable throughout the irrigation season at any given drain, as well as quite variable between the eight drains. No one drain was ‘typical.’ Nor did any one portion of the irrigation season have predominantly high or low concentrations throughout the drains.
- Seven of the eight ungaged drains had 90th percentile turbidity values of less than the TMDL goal of 25 Nephelometric Turbidity Units (NTU). DR 27 was close to but did not meet the goal with a 90th percentile value of 27 NTU.

This project allowed SYCD to increase our understanding of water quality conditions throughout our district. The results also provided assurances that on-going sampling efforts by other agencies which focus on Sulphur Creek Wasteway and Granger Drain are not missing significant sources of suspended sediment, nutrients, or bacteria to the Yakima River by not sampling the ungaged drains. Finally, the project provided high-quality, relevant data for Ecology’s TMDL effectiveness monitoring.

Introduction

In 2003, the Department of Ecology (Ecology) evaluated the effectiveness of the first five years of implementing the Lower Yakima River Suspended Sediment TMDL by determining changes in water quality since the original 1995 assessment. To do so, Ecology gathered data on turbidity and total suspended solids at four sites in the Yakima River and five major irrigation return drains during the 2003 irrigation season. The Yakama Nation and Wapato Irrigation Project gathered data from tribal drains. SYCD obtained a grant from Ecology to gather data from the ungaged drains.

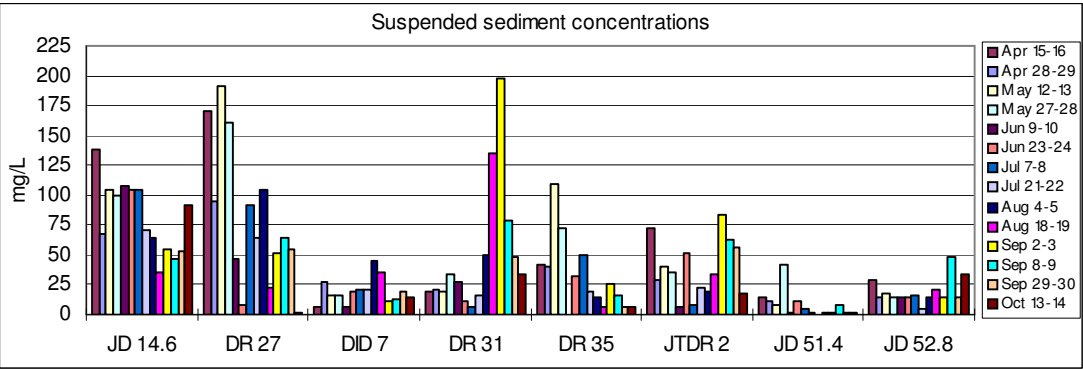
The eight drains sampled for this project were: Joint Drain (JD) 14.6, Drain (DR) 27, Drainage Irrigation District (DID) 7, DR 31, DR 35, Joint Drain crossing county lines (JTDR) 2, JD 51.4, and JD 52.8. These were all the drains that could be located on the non-tribal side of the lower Yakima River with direct discharges to the river of more than one cubic foot per second (cfs).



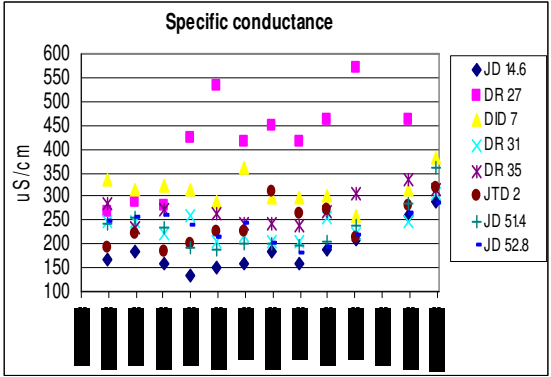
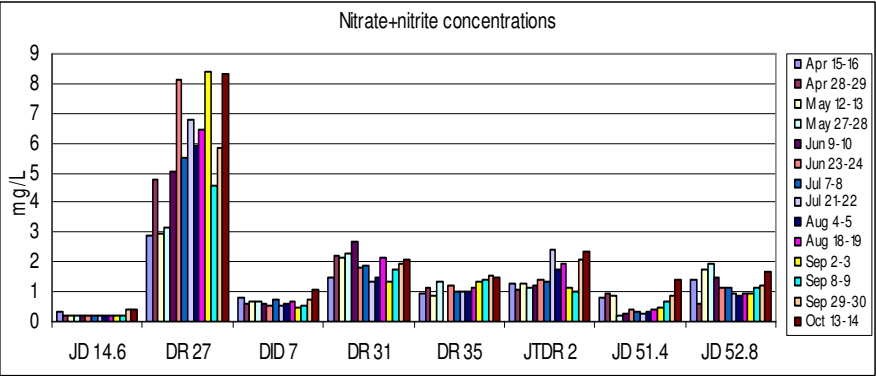
Sources of total suspended solids (TSS) in the original 1995 TMDL assessment.

What Did We Learn?

Variability. Concentrations of most constituents ranged widely between drains and throughout the season (for example, see chart of suspended sediment concentrations, below). For any given constituent, no time period had uniformly low or high concentrations in all the drains.



Nitrate. No single drain stood out as highly unusual except for nitrate in DR 27. The concentrations of nitrate in the other ungaged drains ranged roughly from 0.2 to 3 milligrams per liter (mg/L) nitrate, while DR 27 ranged roughly from 3 to 8 mg/L. Based on specific conductance data, which showed an abrupt increase in conductivity after the first three sampling events, it is possible the proportion or source of groundwater present in the drain changed sometime in late May to early June. Of the conditions observed in these drains, nitrate concentrations in DR 27 were most appropriate for further investigation.



Phosphorus. Total phosphorus concentrations appeared to be spatially related. The four western-most drains (circled yellow in the chart and map, below) had roughly 0.1 mg/L higher median total phosphorus concentrations than the four eastern-most drains (circled blue). Data from the Roza-Sunnyside Board of Joint Control for Granger Drain (GD) and Sulphur Creek Wasteway (SCWW) were included in the chart for comparison purposes.

No reason could be found for the higher phosphorus concentrations in the western four drains. The soil types present in the drainages would not explain differing phosphorus concentrations. There were dairies present, and thus phosphorus-rich manure used as fertilizer, in seven out of the eight drainages. Although differences in crop types could be a factor (e.g., row crop vs. permanent crops), turbidity values and suspended sediment concentrations did not follow the same distinct western/eastern pattern as phosphorus. However, turbidity values and suspended sediment concentrations reflect current irrigation practices while phosphorus concentrations in soils reflect both current and historical practices. The phosphorus concentrations could possibly reflect historical cropping differences in these drainages but historical data are unavailable.

